

Linzer biol. Beitr.	47/2	1501-1511	30.12.2015
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An annotated checklist of the Iranian carrion beetles (Coleoptera: Staphylinoidea: Silphidae)

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A b s t r a c t : An updated list of Iranian Silphidae LATREILLE (Coleoptera) is presented and discussed in this paper. For Iranian fauna, there are records of 28 species distributed in 8 genera (*Ablattaria* REITTER, *Aclypea* REITTER, *Dendroxena* MOTSCHULSKY, *Necrodes* LEACH, *Nicrophorus* FABRICIUS, *Phosphuga* LEACH, *Silpha* LINNAEUS, *Thanatophilus* LEACH) and 2 subfamilies, Nicrophorinae and Silphinae. *Thanatophilus porrectus* (SEmenov) is new record for the fauna of Iran.

K e y w o r d s : Coleoptera, Silphidae, Checklist, Iran.

Introduction

The family Silphidae (carrion beetles) belongs to the superfamily Staphylinoidea and is divided into two subfamilies, Nicrophorinae (called burying beetles or sexton beetles), and Silphinae (LAWRENCE & NEWTON 1982; PECK & MILLER 1993; SIKES 2005). Some taxonomists often include a third subfamily, Agyrtinae in the Silphidae (MADGE 1980; HASTIR & GASPAR 2001), but recent phylogenetic analyses (NEWTON 1998; CATERINO et al. 2005) separate the Agyrtinae from the Silphidae and consider it as a valid family (PECK 1990; RATCLIFFE 1996; DOBLER & MÜLLER 2000; DEKEIRSSCHIETER et al. 2011). The family Silphidae is a small group of ca. 200 species worldwide (NEWTON 1991). They are usually medium to large in size (7 to 45 mm) (HASTIR & GASPAR 2001; DEBREUIL 2003; SIKES 2008). Carrion beetles are a conspicuous element of that vast host of scavengers that are responsible for breaking down and recycling back into the ecosystem the basic elements found inside of each organism (PECK 1990; RACLiffe 1996; KALINOVA et al. 2009). Most Silphids are carrion feeders (necrophagous species) but can also prey on other carrion inhabitants such as fly eggs or maggots and other small carrion beetles (necrophilous species), some others (*Ablattaria* and *Dendroxena*) are specialized as snail predators, and *Aclypea* is herbaceous (SIKES 2005, 2008; DEKEIRSSCHIETER et al. 2011). The fauna of Iranian Silphidae was poorly studied, and the aim of this paper is to improve the knowledge of distribution of the carrion beetles in Iran.

Material and Methods

The published data on distribution of the family Silphidae (Coleoptera) in Iran are sum-

marized by province. Subfamilies, tribes, genera and species are listed alphabetically. The following data are included in the catalog for each species: (1) valid name, (2) published Iranian records synthetized by province (classified by alphabetical order of Iranian province names) and the relevant references (classified by chronological order), (3) synthetical information on general distribution on a world scale and feeding habits, (4) about the new country records. Data about classification, nomenclature and distribution are mainly based on LÖBL & SMETANA (2004) have been followed. When accurate data about local distribution in Iran are lacking in a quoted reference, the mention "Iran (no locality cited)" is used.

Results

In total 28 species of Silphidae from 8 genera and 2 subfamilies (Nicrophorinae and Silphinae) were recorded from Iran. *Thanatophilus porrectus* (SEmenov) is new record for the fauna of Iran. The list of species is given below with distribution data.

Family S i l p h i d a e LATREILLE, 1807

Subfamily Nicrophorinae KIRBY, 1837

Genus *Nicrophorus* FABRICIUS, 1775

Nicrophorus antennatus (REITTER, 1884)

Distribution in Iran: Khorasan, West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (PORTEVIN 1906; SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region; Afghanistan (RUŽIČKA & SCHNEIDER 2002), India (PORTEVIN 1906; SIKES et al. 2002); China (LÖBL & SMETANA 2004).

Nicrophorus germanicus (LINNAEUS, 1758)

Distribution in Iran: West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), western Iran (no locality cited) (SHCHEGOLEVA-BAROVSKAYA 1933; NIKOLAEV & KOZMINYKH 2002), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Western Palaearctic species (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

Nicrophorus humator (GLEDITSCH, 1767)

Distribution in Iran: East Azarbaijan, Mazandaran, Tehran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (PORTEVIN 1906; SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Nicrophorus interruptus* STEPHENS, 1830**

Distribution in Iran: Mazandaran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (NIKOLAEV & KOZMINYKH 2002; SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Nicrophorus investigator* (ZETTERSTED, 1824)**

Distribution in Iran: Mazandaran (SAKENIN et al. 2009), Tehran (RUŽIČKA 1996), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Holarctic region (SIKES et al. 2002; LÖBL & SMETANA 2004).

***Nicrophorus morio* GEBLER, 1817**

Distribution in Iran: Mazandaran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Afghanistan, China, Mongolia, Russia, Turkmenistan, Kazakhstan, Kyrgyzstan, Uzbekistan (SIKES et al. 2002; LÖBL & SMETANA 2004).

***Nicrophorus nigricornis* FALDERMANN, 1835**

Distribution in Iran: East Azarbaijan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Known from Azerbaijan, Armenia, Georgia, Russia, north-eastern Turkey, Kazakhstan and northern Iran (ZAITZEV 1914; SHCHEGOLEVA-BAROVSKAYA 1933; HÁVA et al. 1998; NIKOLAEV & KOZMINYKH 2002; SIKES et al. 2002; LÖBL & SMETANA 2004).

***Nicrophorus satanas* REITTER, 1893**

Distribution in Iran: Guilan (SAKENIN et al. 2009), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Afghanistan, Iran, South-eastern Russia, Pakistan, China, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan (SHCHEGOLEVA-BAROVSKAYA 1933; NIKOLAEV & KOZMINYKH 2002; SIKES et al. 2002; SIKES et al. 2002; LÖBL & SMETANA 2004).

***Nicrophorus sepulcator* CHARPENTIER, 1825**

Distribution in Iran: Mazandaran (GHAHARI et al. 2015 as *Nicrophorus confusus* PORTEVIN, 1924), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Azerbaijan, Armenia, China, Georgia, Europe, Iran, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Transcaucasia, Turkey, Ukraine, Uzbekistan (HÁVA et al. 1998; SIKES et al. 2002; LÖBL & SMETANA 2004).

***Nicrophorus vespillo* (LINNAEUS, 1758)**

Distribution in Iran: Ardabil (GHAHARI et al. 2012), Guilan (RUŽIČKA & SCHNEIDER 2002), Mazandaran (RUŽIČKA & SCHNEIDER 2002; GHAHARI et al. 2012), Iran (no locality cited) (NIKOLAEV & KOZMINYKH 2002; SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Nicrophorus vespilloides* HERBST, 1784**

Distribution in Iran: East Azarbaijan (GHAHARI et al. 2012), Guilan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), Tehran (RUŽIČKA 1996), Iran (no locality cited) (SIKES et al. 2002; LÖBL & SMETANA 2004).

General distribution: Widely distributed across the Holarctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

Subfamily Silphinae LATREILLE, 1807

Genus *Ablattaria* REITTER, 1885

***Ablattaria arenaria* (KRAATZ, 1876)**

Distribution in Iran: Khuzestan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (PORTEVIN 1906; SCHAWALLER 1979; MODARRES AWAL 1997; LÖBL & SMETANA 2004).

General distribution: Cyprus, Greece, Russia south European part, Turkey, Iran, Iraq, Israel, Jordania, Lebanon, Syria (SCHAWALLER 1979; HÁVA et al. 1998; LÖBL & SMETANA 2004).

***Ablattaria laevigata cibrata* (MÉNÉTRIES, 1832)**

Distribution in Iran: East Azarbaijan (SCHAWALLER 1979), Golestan, Khorasan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), Guilan (RUŽIČKA 1996; RUŽIČKA & SCHNEIDER 2002; SAKENIN et al. 2009), northwestern Iran (no locality cited) (SCHAWALLER 1979), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Known from Azerbaijan, Armenia, Georgia, Russia, Iran, Turkmenistan (SCHAWALLER 1979; KRYZHANOVSKIY & SABIROVA 1981; LÖBL & SMETANA 2004).

Genus *Aclypea* REITTER, 1885

***Aclypea cicatricosa* REITTER, 1884**

Distribution in Iran: Kerman (RUŽIČKA 1996), Lorestan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (LÖBL & SMETANA 2004; NIKOLAEV & KOZMINYKH 2002).

General distribution: Endemic to Iran (REITTER 1884; RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Aclypea opaca* (LINNAEUS, 1758)**

Distribution in Iran: Golestan (GHAHARI et al. 2012), Kermanshah (MODARRES AWAL 1997), Mazandaran (SAKENIN et al. 2009).

General distribution: Widely distributed across the Holarctic region (LÖBL & SMETANA 2004).

H o s t s : Barley, carrot, corn, lucerne, potato, sugar-beet, wheat (MODARRES AWAL 1997).

***Aclypea pamirensis* JAKOWLEW, 1887**

Distribution in Iran: North and northeastern Iran (MODARRES AWAL 1997).

General distribution: Iran (MODARRES AWAL 1997), Tadzhikistan (LÖBL & SMETANA 2004).

H o s t s : Sugar-beet (MODARRES AWAL 1997).

Comment: *A. pamirensis* was previously reported only from Tajikistan and the occurrence of this species in Iran needs confirmation.

***Aclypea turkestanica* (BALLION, 1871)**

Distribution in Iran: Khorasan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), North and northeastern Iran (MODARRES AWAL 1997), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Widely distributed in Middle Asia, reaching as far as Kashmir and China (NIKOLAEV 1990; SCHAWALLER 1996; RÜŽIČKA et al. 2002), Afghanistan (NIKOLAEV & KOZMINYKH 2002), Pakistan (SCHAWALLER 1996), Kazakhstan, Kyrgyzstan, Tadzhikistan, Turkmenistan, Uzbekistan (LÖBL & SMETANA 2004).

***Aclypea undata* (MÜLLER, 1776)**

Distribution in Iran: Guilan (RUŽIČKA & SCHNEIDER 2002), Isfahan, Lorestan, West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), Kermanshah (MODARRES AWAL 1997), Mazandaran (RUŽIČKA 1996), Tehran (RUŽIČKA 1996; RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SCHAWALLER 1996; LÖBL & SMETANA 2004).

General distribution: Palaearctic species, widely distributed from Europe to western Siberia (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

Habits: Sugar-beet (MODARRES AWAL 1997).

Genus *Dendroxena* MOTSCHULSKY, 1858

***Dendroxena quadrimaculata* SCOPOLI, 1771**

Distribution in Iran: Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Widely distributed across the Holarctic region (LÖBL & SMETANA 2004).

Genus *Necrodes* LEACH, 1815

***Necrodes littoralis* (LINNAEUS, 1758)**

Distribution in Iran: Khorasan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (PORTEVIN 1922; 1926), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (LÖBL & SMETANA 2004); Afghanistan (NIKOLAEV & KOZMINYKH 2002), India (PORTEVIN 1922; 1926; RUŽIČKA & SCHNEIDER 2002), Pakistan (SCHAWALLER 1982; RUŽIČKA & SCHNEIDER 2002).

Genus *Phosphuga* LEACH, 1817

***Phosphuga atrata* (LINNAEUS, 1758)**

Distribution in Iran: Lorestan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (NIKOLAEV & KOZMINYKH 2002), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

Genus *Silpha* LINNAEUS, 1758

***Silpha obscura obscura* LINNAEUS, 1758**

Distribution in Iran: north and northwestern Iran (SCHAWALLER 1980),

Chaharmahal & Bakhtiari, Golestan, Khorasan, West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), East Azarbaijan, Guilan, Mazandaran (RUŽIČKA 1996; RUŽIČKA & SCHNEIDER 2002), Guilan (SAKENIN et al. 2009; RUŽIČKA & SCHNEIDER 2002), Mazandaran (RUŽIČKA 1996; RUŽIČKA & SCHNEIDER 2002; SAKENIN et al. 2009), Qazvin (RUŽIČKA 1996), Tehran (RUŽIČKA 1996; MODARRES AWAL 1997; RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SCHAWALLER 1980), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (LÖBL & SMETANA 2004).

H o s t s : Barley, corn, radish, sugar-beet, turnip, wheat (MODARRES AWAL 1997).

***Silpha tristis* ILLIGER, 1798**

Distribution in Iran: Guilan, Mazandaran (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (PORTEVIN 1906), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: European species, known also from western Caucasus and northeastern Turkey (ZAITZEV 1914; PORTEVIN 1926; HATCH 1928; HÁVA et al. 1998; NIKOLAEV & KOZMINYKH 2002; LÖBL & SMETANA 2004).

Genus *Thanatophilus* LEACH, 1815

***Thanatophilus ferrugatus* SOLSKY, 1874**

Distribution in Iran: Golestan, Guilan (SAKENIN et al. 2009), Khorasan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (LÖBL & SMETANA 2004).

General distribution: Known from southern Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan (SCHAWALLER 1982; NIKOLAEV & KOZMINYKH 2002; LÖBL & SMETANA 2004), Afghanistan (NIKOLAEV & KOZMINYKH 2002).

***Thanatophilus porrectus* (SEMENOV, 1891)**

Material examined: Khorasan province, Taybad, 786 m, 34°48'N 60°40'E, 1♂, 1♀, June 2010. **New record for Iran.**

General distribution: Widely distributed from Armenia to northern and western part of Central Asia (including Pamir mts and Karakorum mts), western China and Far East of Russia (SCHAWALLER 1982; RUŽIČKA & SCHNEIDER 1996; NIKOLAEV & KOZMINYKH 2002), Afghanistan, Pakistan (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Thanatophilus rugosus* (LINNAEUS, 1758)**

Material examined: West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SCHAWALLER 1982; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Thanatophilus sinuatus* (FABRICIUS, 1775)**

Distribution in Iran: East Azarbaijan, Golestan, Khorasan (RUŽIČKA & SCHNEIDER 2002), Tehran (RUŽIČKA 1996), Iran (no locality cited) (SCHAWALLER 1982; MODARRES AWAL 1997; LÖBL & SMETANA 2004).

General distribution: Widely distributed in the Palaearctic region (RUŽIČKA & SCHNEIDER 2002; LÖBL & SMETANA 2004).

***Thanatophilus terminatus* (HUMMEL, 1825)**

Distribution in Iran: East Azarbaijan, Khorasan, West Azarbaijan (RUŽIČKA & SCHNEIDER 2002), Iran (no locality cited) (SCHAWALLER 1982; LÖBL & SMETANA 2004).

General distribution: Known from southern Ukraine (Crimea), Romania, southern Russia and Turkey to Central Asia, reaching south-western Siberia and western China in the east (SCHAWALLER 1982; NIKOLAEV & KOZMINYKH 2002; LÖBL & SMETANA 2004).

Discussion

This checklist with 28 species distributed in 8 genera indicates that the fauna of Iranian Silphidae is rather diverse. Among the 8 genera, *Nicrophorus* with 11 recorded species is more diverse than the others. However, Iran is a large country incorporating various geographical regions and climates and we expect that other species remain to be discovered. To find new species and distributional records, more studies should be conducted on this insect group in Iran. Carrion beetles can be used in forensic entomology as bioindicators. Silphids and principally burying beetles (*Nicrophorus* spp.) are widely studied in various contexts including biology and ecology (RATCLIFFE 1996; SCOTT 1998; DEKEIRSSCHIETER et al. 2011). These studies are absent on Iranian carrion beetles and can be valuable research programs. The decay process is an efficient and natural system whereby the raw materials of dead organisms are returned directly into the energy budgets of living organisms when they consume the dead ones (RATCLIFFE 1996).

Acknowledgments

The authors are grateful to J. Ruzicka of Czech Republic for providing the necessary papers. The research was supported by Islamic Azad University (Yadegar - e- Imam Khomeini (RAH) Branch) and Czech Agricultural University.

Zusammenfassung

Vorliegende Arbeit gibt einen Überblick des Vorkommens der Familie Silphidae LATREILLE (Coleoptera) im Iran. Es gelang der Nachweis von 28 Arten, aufgeteilt auf die Gattungen *Ablattaria* REITTER, *Aclypea* REITTER, *Dendroxena* MOTSCHULSKY, *Necrodes* LEACH, *Nicrophorus* FABRICIUS, *Phosphuga* LEACH, *Silpha* LINNAEUS und *Thanatophilus* LEACH sowie die Unterfamilien Nicrophorinae und Silphinae. *Thanatophilus porrectus* (SEMENOV) ist ein Erstnachweis für die Fauna des Irans.

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